

KEELOQ® HCS5XX Decoder Family

The HCS5XX decoder utilizes the patented KEELOQ® code-hopping system and high security learning mechanisms to make this canned solutions when used with the HCS encoders to implement uni-directional remote and access control systems. The HCS5XX decoders operate over a wide voltage range and can be used as stand-alone decoders or in conjunction with a PICmicro® MCU through serial or parallel interface. Microchip also offers a variety of software decoders that allows the system designer to integrate the KEELOQ decoding functions with their application onto a single PICmicro MCU. The software decoders come as part of a licensing package (DS40149) and include the decoding algorithm, receive routines and support various learning schemes to reduce development time and get the product to market faster.

Security Features:

- Encrypted storage of manufacturer's code
- Encrypted storage of encoder decryption keys
- Up to seven transmitters can be learned code hopping technology
- Normal and secure learning mechanisms

Operating Features:

- 4.5V – 5.5V operation
- Internal oscillator
- Auto-bit rate detection

Other Features:

- Stand-alone decoder
- Internal EEPROM for transmitter storage
- Synchronous serial interface
- 1 Kbit user EEPROM
- 14-pin DIP/SOIC package

Compatible Encoders (PWM Mode):

- HCS200, HCS201, HCS300, HCS301, HCS320, HCS360, HCS361, HCS362, HCS365, HCS370, HCS410, HCS412, HCS473

Typical Applications:

- Automotive remote entry systems
- Automotive alarm systems
- Automotive immobilizers
- Gate and garage openers
- Electronic door locks
- Identity tokens



- Burglar alarm systems

Related Application Notes:

- AN217 – KEELOQ HCS30X, HCS200 Stand-Alone Programmer
- AN645 – PIC16C57 -Based Code Hopping Security System
- AN661 – Code Hopping Decoder using PIC16C56
- AN662 – Code Hopping Decoder using Secure Learn
- AN663 – Simple Code Hopping Decoder
- AN665 – Using KEELOQ to Generate Hopping Passwords
- AN672 – PICmicro® Mid-range MCU Code Hopping Decoder
- AN740 – Decoding the HCS101 for Non-Secure Applications
- AN742 – Modular PICmicro Mid-Range Code Hopping Decoder
- AN744 – Modular Mid-Range PICmicro KEELOQ Decoder in C
- TB001 – Secure Learning RKE Systems using KEELOQ Encoders
- TB003 – An Introduction to KEELOQ Code Hopping
- TB021 – A Guide to Designing for EuroHomelink Compatibility
- TB042 – Interfacing a KEELOQ Encoder to a PLL Circuit
- TB043 – KEELOQ CRC Verification Routines



MICROCHIP

KEELOQ® Secure Data Products

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Additional Information:

- Microchip's web site: www.microchip.com
- Microchip's Technical Library CD-ROM, [Order No. DS00161](#)
- *Secure Data Products Handbook*, [Order No. DS40168](#)
- Application Notes are available in:
 - *Embedded Control Handbook*, [Order No. DS00092](#)
 - *Embedded Control Handbook, Volume 2, Math Library*, [Order No. DS00167](#)
 - *Embedded Control Handbook Update 2000*, [Order No. DS00711](#)
- Microchip's *Non-Volatile Memory Products Data Book*, [Order No. DS00157](#)
- Microchip's *Overview, Quality Systems and Customer Interface System*, [Order No. DS00169](#)
- Third Party software and hardware support:
 - Emulators
 - Programmers
 - Gang Programmers
 - Software Tools
 - Development Boards and Accessories
 - Design Consultants
 - *Third Party Guide*, [Order No. DS00104](#)

HCS4XX Family Lineup										
Product	User Memory (bits)	Function Outputs	Receive Bits	Modulation Format	Maximum Transmitters Learned	Serial Interface	VLow Output	Encoder Supported	Operating Voltage	Packages Pins
HCS500	1K*	1	67	PWM	7	Yes	Yes	HCS200, 201, 300 HCS301, 320, 360 HCS361, 410, 412	4.5V – 5.5V	8P, 8SM
HCS512	—	4	67	PWM	4	Yes	Yes	HCS200, 201, 300 HCS301, 320, 360 HCS361, 410, 412	3.0V – 6.0V	18P, 18SO
HCS515	1K	2	67	PWM	7	Yes	Yes	HCS200, 201, 300 HCS301, 320, 360 HCS361, 410, 412	4.5V – 5.5V	14P, 14SL

* With external EEPROM

Development Tools from Microchip		Resale Price*
KEELOQ Evaluation Kit	Demonstrate, evaluate and prototype KEELOQ devices	\$299
KEELOQ Transponder Evaluation Kit	Demonstrate, evaluate and prototype KEELOQ devices	\$399

*All prices are manufacturer's suggested resale for North America.

Frequently asked questions

What is KEELOQ Code Hopping and why do I need it?

KEELOQ Code Hopping is a technology developed specifically for secure remote keyless entry and authentication. The basic principle is that the code change (hop) each time it is transmitted. It is equivalent to changing the mechanical key on a door each time after you lock or unlock the door. This makes it nearly impossible for a thief to capture and re-transmit the code used to lock/unlock a door or vehicle.

How do I get started with KEELOQ?

The easiest way to get hands-on experience with KEELOQ is to purchase a KEELOQ Evaluation Kit. The evaluation kit contains a complete hardware system that includes receiver, decoder and different learning options. It also includes easy to use software that allows you to program the various devices and display the results of encrypting and decrypting data.

What is the KEELOQ Licensing disk and how do I get it?

The KEELOQ Licensing disk contains various firmware implementations of decoders that enable you to decrypt the code-hopping portion of the KEELOQ transmissions. It also contains application notes and Windows® software that allows you to encrypt, decrypt and experiment with various Learning Schemes. The Licensing disk is free and available through the Literature Center (DS40149).

What is Learning?

Learning is a method to match the encoder (transmitter) to the decoder (receiver). There are various Learning methods that depend on the level of security the user requires.

Customer Support:

Microchip maintains a worldwide network of distributors, representatives, local sales offices, Field Application Engineers, and

Microchip Technology Inc. • 2355 W. Chandler Blvd. • Chandler, AZ 85224-6199 • (480) 792-7200 • FAX (480) 792-9210

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